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U.S. CONSTITUTION

Principles challenged by advances in science and technology

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CHEMICAL & ENGINEERING
NEWS
OCTOBER 19, 1987

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News of the Week

■ **Nobel Prize in Chemistry shared by two Americans and Frenchman; winners in medicine and physics also are announced.** **Page 4**

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■ **OSHA data on occupational illnesses and injuries are inadequate, providing too little information to maintain prevention program, says NRC panel report.** **Page 6**

Business

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Polyurethane World Congress marks 50th anniversary of polyurethane patent, looks at future of polyurethane business. **Page 20**

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Cover: U.S. Constitution, Bill of Rights, and Declaration of Independence on permanent display in rotunda of National Archives building, Washington, D.C. Photo by Stephen R. Brown, courtesy of National Archives

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LETTERS

Air pollution reports

SIR: Harry Walker (C&EN, Aug. 24, page 5) remarked about one problem caused by unquestioning acceptance of Environmental Protection Agency theories. Another problem is that very little criticism of their clean air policies is ever seen in the mass media, or even in C&EN. Local government officials in and near Denver often claim a crisis in air quality, referring to EPA reports. But the details, when published by local media, don't seem to justify the crisis atmosphere. For instance, the majority of air quality violations were reported from one monitoring station in a congested area of downtown Denver; monitors in near suburban areas often found no violations in a year or more. Appearances of a brown cloud over Denver are often blamed on motor vehicles, but the brown cloud was remarked on in 1874.

Sensational, exaggerated air pollution reports confuse us about what actually needs to be done. They also cause economic harm. Proposals to curtail freedom of travel are made by people who sound perfectly serious. Implementing such proposals would do enormous damage to the economy, and potential investors in Denver area businesses know it. And a casual reader about Colorado could easily believe that several large counties are covered by smog all winter (that is not the case).

C&EN would be a perfect forum for some criticism of the hysteria generated in the struggle to avoid EPA sanctions. I don't think we will ever see such criticism in a local publication.

Robert L. Montgomery
Littleton, Colo.

Abuse and misuse of statistics

SIR: The regrettable problem of fraud and other misconduct in science was addressed recently by Henry H. Bauer (C&EN, July 13, page 34) and by others previously. In a letter, "Scientific malpractice in epidemiology" (C&EN, April 9, 1984, page 76), pertaining particularly to the extrapolation fallacy, I referred to problems of scientific competence (or incompetence), deception, and fraud. See also, "Low-level radiation effects: Extrapolation as 'science' " (C&EN, Jan. 16, 1984, page 75). The Environmental Protection Agency, as was noted, found extrapolation to be "good science."

A letter of Sheldon Meyers, director, Office of Radiation Programs, EPA, June 3, 1987, pertaining to health effects of environmental radon, reiterates adherence to extrapolation as scientifically valid. He states: "[EPA] uses epidemiological studies of underground uranium miners to estimate health effects from low levels of radon exposure. Health effects observed from the levels of radon exposures in these studies are used to estimate health effects from low levels of radon exposure. Health effects observed from the levels of radon exposures in these studies are used to estimate health effects at lower exposures using a linear/no-threshold mathematical model which assumes that cancer incidence is proportional to radiation exposure." The statement is in response to my inquiry about allegations that low levels of radon, such as are naturally emitted geologically, are hazardous to health. Meyers' comments appear to ignore effects of mine dusts and other gases, and appear to attribute all health effects, observed in miners, to radon, rather than to any other environmental variables. Further, epidemiologic findings for uranium miners can hardly be applied judgmentally to persons living in homes in which low levels of radon occur from natural geological seepage. They also ignore documented observations such as are discussed in C&EN, Nov. 3, 1986, page 2, and in C&EN, May 25, page 3.

Further information on health effects of low-level radon was provided by Bernard L. Cohen in an abstract, "Lung cancer induction by environmental radon and its potential for demonstrating hormesis," in "Program and Abstracts," Conference on Radiation Hormesis, Oakland, Calif., Aug. 14-16, 1985 (sponsored by the Northern California sections of the Health Physics Society, the American Nuclear Society, and the Department of Energy, among other groups). Cohen reports: "All studies to date indicate a strong negative correla-

Corrections

- Sept. 14, page 4: Pact on nitrogen oxides control will become a protocol to the Convention on Long-Range Transboundary Air Pollution.
- Sept. 21, page 70: In the box listing 1988 members of the ACS Council's Committee on Committees, Frederick E. Bailey was inadvertently omitted as a continuing member.
- Sept. 28, page 4: Capacity of Rhône-Poulenc's synthetic sodium carbonate operations in France is 580,000 metric tons a year, not 580.

tion between female lung cancer rates and radon exposure. Cumberland County, Pennsylvania, was found to have nine times the average radon exposure, but it has well below average lung cancer rates. A similar situation is reported in a large area in Finland, and a comparison between two well-matched areas of China gives even stronger evidence. All large areas known to have high radon exposures have below average lung cancer rates (e.g., eastern Pennsylvania, eastern North Dakota, Sweden, Finland) and in all high lung cancer rate areas where radon levels have been studied, they have been found to be below average (e.g., England, San Francisco area, New York City area)." Cohen discusses this topic further in "Tests of the linear, no-threshold dose-response relationship for high-LET radiation," *Health Phys.*, **52**, 629 (1987).

Clearly, abuses and misuses of statistics occur in some epidemiological studies involving low-level radon exposure. However, warnings of such abuses have been and are being ignored by some individuals, and by some agencies such as EPA. The question of misuse of public funds, such as for "protection" against natural low-level radon, is in great need of examination.

Richard J. Hickey
Ecological Statistical Group
Department of Statistics (retired)
Wharton School
University of Pennsylvania, Philadelphia

Classifying biochemistry

SIR: A disturbing aspect of the National Science Foundation report "Profiles—Chemistry: Human Resources & Funding" (C&EN, Sept. 7, page 23) is that, for purposes of data collecting and reporting, NSF does not consider biochemistry to be a chemical science. Most would consider the five overarching divisions of chemistry to be analytical, inorganic, organic, physical, and biochemistry. However, NSF reports data for the first four only and separate data for nuclear, pharmaceutical, polymer, theoretical, general and "other" chemistry, but completely ignores biochemistry. ACS, in keeping with its newly adopted mission statement, should work to change this thinking.

Because it is a bridging discipline, biochemistry could also be considered to be a life science, and NSF may prefer to classify it that way for internal bureaucratic reasons; but to omit from the statistical analysis of employment and opportunities in chemistry the subdiscipline that is a major producer of Ph.D. chemists and offers many employment opportunities is most disturbing. That some educating needs to be done is suggested.

James N. BeMiller
Director, Whistler Center for Carbohydrate Research, Purdue University

New use for tacrine

SIR: Like many others who have relatives affected by Alzheimer's disease, I was delighted to read (C&EN, Aug. 17, page 4) of the $5 million project for clinical trials of THA. May I correct one error in this report—that the drug has been known since 1908? That was the date of Borsche's synthesis of the parent, 1,2,3,4-tetrahydroacridine of which THA is the 9-amino derivative. Rather, tacrine (to use the international generic name) was first prepared during World War II in work carried out for the Australian Army which delayed publication for three years [Albert, A., Gledhill, W., *J. Soc. Chem. Indust., London*, **64**, 169 (1945)].

Its ability to stimulate the central nervous system benignly (an analeptic action) [Shaw, F., Bentley, G., *Med. J. Austral.*, **ii**, 868 (1949)] led to its use for promoting mental alertness in patients undergoing morphine therapy for terminal cancer [Stone, J., Moon, J., Shaw, F., *Brit. Med. J.*, **i**, 471 (1961)]. May its newfound use bring benefit to a new category of sufferers.

Adrien Albert
Emeritus Professor
Australian National University, Canberra

Strong commitment to safety

SIR: A government concentrate (C&EN, Aug. 3, page 17) incorrectly states that the Occupational Safety & Health Administration "has begun a comprehensive review of injury and illness record-keeping practices at all facilities operated under the names of E. I. du Pont de Nemours & Co., Du Pont, and Remington Arms Co."

The comprehensive review, in fact, was started by the companies on their own prior to reaching a negotiated settlement with OSHA on various record-keeping cases.

Over the years, Du Pont has demonstrated a strong commitment to safety and health and in this case was making every effort to comply with federal record-keeping requirements. To suggest that OSHA has initiated a corporate-wide review unfairly characterizes the companies' efforts to identify and correct any record-keeping problems that may exist in their facilities.

OSHA's policy is to encourage every employer to do just that.

John A. Pendergrass
Assistant Secretary of Labor
Occupational Safety & Health Administration

Up to industry standard

SIR: In the article about drugs in the chemical workplace (C&EN, Aug. 3, page 7), there is an omission that needs correction. In the chart (page 9) that lists chemical producers and their drug-screening programs, Hoechst Celanese is listed correctly as having pre-employment screening, and testing for cause.

However, Hoechst Celanese also requires urine tests confirmed with gas chromatography/mass spectrometry, and the company also provides an employee-assistance program.

We know our company's policies are up to industry standard, and we want your readers to be aware of it as well.

John D. Dougherty
Corporate Medical Director
Hoechst Celanese
Somerville, N.J.

Correct figures

SIR: I am writing to correct an error contained in a special report entitled, "Facts & Figures for Chemical R&D" (C&EN, July 27, page 32). The table on page 61 of this report, which was compiled on the basis of data provided by the National Science Foundation, listed total support of chemical research at UT, Austin, at $4.588 million for fiscal year 1985. This reported level of funding causes the ranking of our department to drop to 27th from its position of seventh in the previous fiscal year.

Subsequent investigation into this dramatic change in research funding and ranking, as reflected in the compilation, has revealed that a mistake was made in reporting our local data. The correct figures for UT, Austin, for the fiscal year should be $7.908 million in total funding with $4.741 million (60%) of that being from federal sources. Consequently, our department should have been ranked sixth in the report.

John C. Gilbert
Chairman, Department of Chemistry
University of Texas, Austin

Canadian Chemical Exec Bélanger Discusses Prospects for Free Trade

Earlier this month, tired negotiators from the U.S. and Canada managed to put together a historic free trade agreement between the two countries. Details of the agreement are still sketchy, and it may take some time before businessmen on both sides of the border are able to assess the agreement's impact on them.

Although the U.S. chemical industry never came out against a U.S.-Canadian free trade agreement, it never was a staunch supporter of the idea either. In Canada, however, the chemical industry was one of the trade agreement's strongest advocates. This support funneled from the Canadian chemical companies to the relevant Canadian government agencies through the Canadian Chemical Producers' Association (CCPA), which is Canada's equivalent to the Chemical Manufacturers Association in the U.S.

Before trade negotiators actually reached an agreement—in fact, during a touchy period in the negotiations when it appeared that they might not reach agreement—C&EN senior editor Earl Anderson spoke with CCPA's president Jean M. Bêlanger about the free trade agreement and why Canada's chemical industry has been such a strong supporter.

Bêlanger's position as CCPA's chief administrative officer puts him squarely in the middle of the chemical industry-government interface in Canada. A chemical engineering graduate from the University of Ottawa, he also spent 20 years in the Canadian government before joining CCPA. That included five years as director-general of the chemicals branch of the Department of Industry, Trade & Commerce.

What is CCPA and what does it do?

CCPA probably would be best understood as a parallel, albeit on a smaller scale, to the Chemical Manufacturers Association (CMA) in the U.S. Broadly, we deal with the same kinds of people—the chemical manufacturing base in Canada. Companies must make a chemical product in Canada to qualify for membership. We have about 70 member companies, which represent close to 90% of the value of chemical production in Canada.

When you say they must make a chemical, does that exclude such companies as fabricated plastics products producers?

That's right. We go up to and include the resins producers, but producers of plastics fabricated products would not be eligible. Neither would companies that make formulated pesticides, nor paints and coatings. These companies have their own associations. In fact, the association structure in Canada is quite similar to that in the U.S.

Yet, StatsCan (Statistics Canada, the "Census Bureau" of Canada) includes fabricated plastics products in its chemical trade statistics.

StatsCan is very good at dealing with the more traditional products, such as steel or pulp and paper. But the chemical industry's product lines have evolved so much that StatsCan has not caught up with some of these things. I think it is doing a very good job in many aspects, but in terms of truly representing the chemical industry through its statistics, I don't think it is there yet.

I gather from some of the statistics that I receive from the Department of Regional Industry & Economics that its chemical people take StatsCan numbers and reassemble them into something that's more representative of the Canadian chemical industry.

That's right, they do. And so do we. I think that we (CCPA) have the most extensive data available on the Canadian chemical industry. We break the industry down into three basic groups—petrochemicals, inorganics, and organics/specialties. Lines are not absolute, of course, but I think that our data present a pretty accurate picture of the Canadian chemical industry.

And what does that picture show?
It shows a chemical industry in Canada with sales in the $8 billion to $9 billion range. I'm speaking Canadian dollars here.

You mentioned the parallel between CCPA and CMA. I gather that there are frequent meetings between the two organizations. How did this come about?
First, one point. We have a lot of respect for CMA. It has created and received a lot of credibility for the U.S. chemical industry. It has taken a positive approach in presenting the chemical industry as a responsible industry. Our affinity for CMA comes from the fact that we have a lot of respect for its views. So we have found it very easy to deal with CMA. That's the first point and I think CMA deserves credit.

Many are "technical issues"—occupational health, the environment, regulatory—and they are cropping up all over the world

Second, we must recognize that many issues transcend national borders. Many are "technical issues"—occupational health, the environment, regulatory—and these issues are cropping up all over the world. So a lot of people have to talk with each other, be they government, be they industrialists, or be they private or public interest groups. It is in these areas that CCPA and CMA became most intensively involved at the start.

It sounds as if you two are trying to solve mutual problems rather than adversarial problems.
Very much so, particularly on the technical side. On the business and economics side, we've had a more general approach. CMA president Robert Roland and I have met periodically and we exchange correspondence. Here again, we are being driven to look at issues to see how we are going to deal with them.

Very obviously, one of the major issues now is the proposed Canadian-U.S. free trade agreement. It certainly is for us, and we would hope that it is for the American chemical industry as well.

On this one, we have had meetings with CMA, first to make sure that we understand each other. What's this all about? What's in it for the Canadian chemical industry? What's in it for the U.S. chemical industry? At the start, the meetings were very general. Lately, we have gotten more specific.

For example, how do you deal with rules of origin? If there is a free trade agreement, our American friends don't want Canada to become a back door for products made in other countries to enter the U.S. duty-free. And we don't want the U.S. to be a back door for Canada, either. This is a genuine concern for both of us.

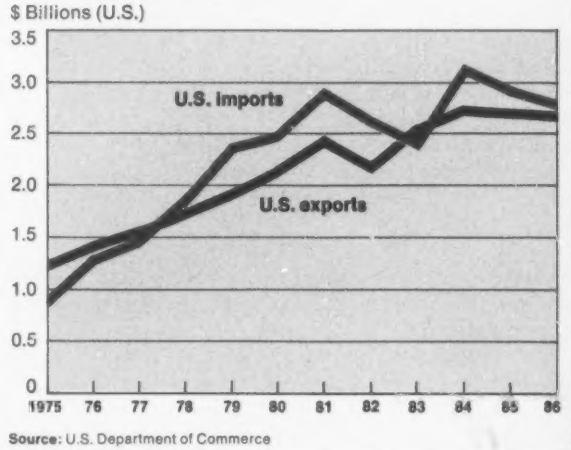
The U.S. chemical industry certainly has other concerns about the trade agreement.
Oh, yes. We recognize the concerns in the U.S. about investment [restrictions] in Canada. We recognize concerns about our energy policy. These are fundamental for any chemical industry. Americans, though, tend to look at our old Foreign Investment Review Agency (FIRA) and say: "If we can't invest in Canada, then we have a major problem with FIRA." But to my knowledge, there never was a foreign investment proposal in the Canadian chemical industry that was turned down by FIRA. Even though FIRA created a bad image in the minds of many U.S. chemical companies, it never did anything detrimental to them.

Is FIRA now history?
Yes, and I think that its replacement, Investment Canada, is sending signals that we really need further investment and that we're talking about investment from anywhere. The door is really open, and I don't think that anyone in the Canadian chemical industry ever did look at where the financing was coming from. Nor do I think that they are doing that now. All we want are good corporate citizens in Canada, just as you want good corporate citizens in the U.S.

But foreign investment is only one sticking point in the free trade agreement. What are some others?
There are quite a few others, but I want to make one very important point. Canada is still the largest market for U.S. exports—for chemicals, for all products. We are a bigger market than Japan, although many Americans don't realize that. We are also a growing market, whereas some of your other markets have been declining, particularly in developing countries.

In fact, we're both each others' best customers. At the same time, there are some trouble spots. And all we're saying is that there must be some way for these

Canada runs slight chemical trade surplus with U.S.



Source: U.S. Department of Commerce

two best customers to talk to each other and arrive at conclusions that are mutually beneficial.

It's obvious that the Canadian chemical industry favors a free trade agreement. But what about the corollary? Do you think that the U.S. chemical industry is as much in favor?

First, the trade agreement has been a much more visible issue in Canada than it has been in the U.S. It is much more the center of our focus up here. You have evidently had other issues that command your attention in the U.S.

It's important to recognize that the Canadian chemical industry is oriented toward a free market economy

But, when you reduce it to the chemical industry per se, no, I have not seen that the American chemical industry is against the trade agreement. Based on discussions that I have had, I think that there's an awful lot of convergence about what we are seeking. We may differ on some details, however.

Just why is the Canadian chemical industry so solidly behind the free trade agreement?

First, let me say that I do not think that Canada will achieve major gains in chemical exports if there is a free trade agreement. But it is going to provide a solid base. I don't foresee a major imbalance in chemical trade between the two countries under such an agreement. There could be some rationalization, but that could benefit both of us. There'll be a lot more competition.

Certainly we want to feel more secure about our market opportunities in the U.S. Obviously, we would like to increase our chemical exports to the U.S. But, under a free trade agreement U.S. chemical companies should be able to export more to Canada as well. And you will get security of supplies in our ever-changing world.

It's important to recognize that the Canadian chemical industry is oriented toward a free market economy. In Canada, the government plays a very little role in the chemical industry. In fact our industry has worked to mold government policy toward a market-driven economy.

You'll recall that a few years ago we had something called the Petrochemical Industry Task Force Report. I know that that report captured some interest in the U.S. What's interesting is that the report, representing an industry, asked the government not to meddle in the Canadian petrochemical industry. We wanted to be allowed to play in a free market. All of the report's recommendations pointed that way.

We wanted deregulation of energy. We wanted free markets. We wanted deregulation of transportation. We wanted, if you will, deregulation of trade. We certainly don't want protection. And I should point out that the government has moved on just about all of our recommendations. Some have been accomplished; some are on their way to being accomplished.

The Canadian petrochemical industry has favored some sort of free trade arrangement with the U.S., originally sectoral free trade, dating back to the Tokyo round days in the late 1970s. But what about other segments of the Canadian chemical industry? Some companies, particularly in the downstream, or specialties, areas were less than enthusiastic about a free trade agreement. Has this changed?

There is no doubt that the Canadian petrochemical industry has had a long-standing interest in freer trade with the U.S. As far as the other sectors of the chemical industry are concerned, these are smaller companies. And it is not unusual for them to oppose a situation that will require them to make some very major changes in the way they will be doing business.

Broadly speaking, however, the Canadian chemical industry is in favor of free trade. All I'm saying is that some companies are going to have a lot of trouble under a free trade agreement. They will need as long an adjustment period as possible, maybe 10 years out on the horizon.

You're talking about a 10-year phase-in of tariff cuts?

Yes, but they may also need to get a little additional help—whatever is allowed for them under a free trade agreement. But even within the specialties sector, there's a good number of Canadian companies that say, "Yes, we can compete. We'll have to change a lot, but we can and we will."

Granted the Canadian industry supports a free trade agreement. What caveats are attached to that support? What have you told your negotiators to be sure to get?

I already mentioned the rules of origin. That's one preoccupation that we share with the U.S. chemical industry. Another important area for us is dispute settlement. We have to have a clear understanding of what we can do and what we can't do. We have the GATT (General Agreement on Tariffs & Trade) rules but they can be interpreted 10,000 different ways. And they can be detrimental to you as well as to us. If

There is no doubt that the Canadian petrochemical industry has had a long interest in freer trade with the U.S.

you go to GATT with a complaint, we get mad at you. If we go, you get mad at us. If we don't go, somebody else gets mad—sometimes our own people.

What about the issue of subsidies?
Here we have to define what is a subsidy, and what is not. Sometimes it is very easy for someone to say that something is a subsidy. Some people in the U.S. point fingers at our regional development programs. But, in the U.S., you also have forms of regional aid. You have municipal bonds at very low interest rates. These are really subsidies. So when you say no more subsidies, are these to be stopped as well? The whole agricultural sector is permeated with subsidies.

We need somebody—some forum—to step in and decide that, yes, that's a subsidy under the terms of the agreement

We in Canada have a perception that some of your defense spending has been used to promote regional development. Defense-oriented plants have been located in certain areas—sure, for defense but also for regional development. So when you say no subsidies, we have to be sure that we understand each other.

So what are you suggesting?
We're saying, let's get more certainty in our relationship. That way, we won't always be fighting, which is so counterproductive. Once we define the rules, there will always be interpretations. Was that bad or wasn't it? So we need somebody—some forum—to step in and decide that, yes, that's a subsidy under the terms of the agreement. And that's not. This is what we call binding dispute settlement.

Will this dispute settlement mechanism be a substitute for U.S. trade remedy laws, such as our antidumping law and the countervailing duty law?
If we both agree on what is fair and what is unfair, then it would seem to me that your trade remedy laws should be used only to counter trade practices of other countries. With a binding dispute settlement mechanism in place, that will be the way that we will do trade with each other.

Speaking of subsidies, both the Canadian government and the Quebec provincial government have poured a lot of money into keeping Pétromont afloat in Montreal. Do you consider this a subsidy?
I'd rather you ask the government or Pétromont. Just let me say that there were some major transitional changes going on at Pétromont. As a result, certain actions had to be taken. It's hard to say how people would interpret the Pétromont thing. In any event, the Canadian chemical industry is on record as opposing subsidies.

It sounds like a difficult subject to reach agreement on.
Maybe, but there has to be some flexibility. At times, there may be a need for broad adjustments. But those adjustments should be made on a very broad area.

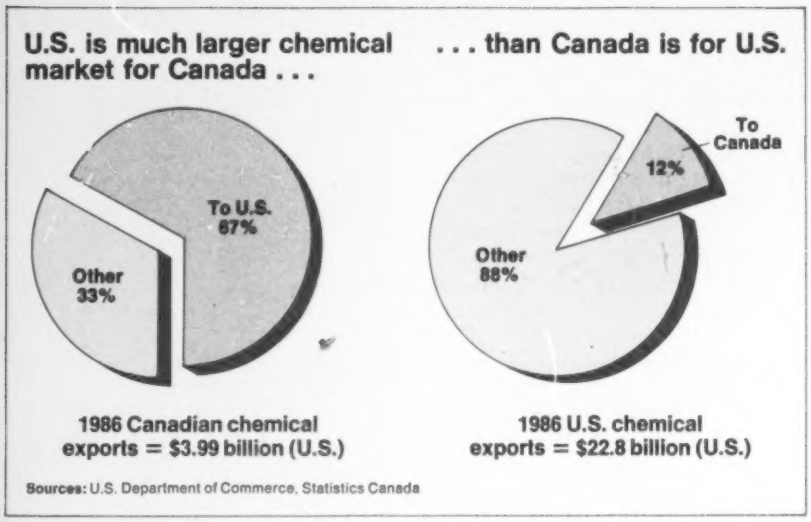
For instance, say the Canadian government wants to help the Maritime provinces, which, as we all know, have economic problems. Whatever the government does should deal with the broad problems of the area. By doing so, it might interest someone to invest in the area or to continue producing there. The help shouldn't be aimed at a particular company. When you do that, not only will American industry complain, but the rest of the Canadian industry that competes with that company will complain as well. We favor a noninterventionistic approach, but where adjustments are necessary, keep them on as broad a basis as possible.

Any other thoughts on a free trade agreement?
We really hope that the American chemical industry will see the benefits it can achieve under this kind of an agreement—benefits not only between Canada and the U.S, though these are major benefits. But another question is how the U.S. will be perceived by the rest of the world. Your government leaders keep saying that the U.S. is willing to trade with anybody provided there is a level playing field. Well, the free trade agreement will provide a level playing field. And because it will, it will be a signal to other countries that they meant what they said.

Before we leave the subject of trade, I notice that Canada's chemical trade deficit worsened last year and the latest available statistics indicate that it may get even worse this year. Is the Canadian chemical industry becoming less competitive on an international level?

We are indeed optimistic that we can be full-fledged participants in the future growth of the international chemical industry

We have to divide that chemical trade deficit into the three components that I mentioned earlier; that is, petrochemicals, inorganics, and organics/specialties. In specialties, the trade deficit is very large, and growing. It now runs about $1.8 billion (Canadian) a year. So in this area, we recognize that we are going to have to make some changes to adjust to a new business environment if there is a free trade agreement. A lot of specialty chemicals are not made in Canada


U.S. is much larger chemical market for Canada . . .
. . . than Canada is for U.S.
To U.S. 67%
Other 33%
To Canada 12%
Other 88%
1986 Canadian chemical exports = $3.99 billion (U.S.)
1986 U.S. chemical exports = $22.8 billion (U.S.)
Sources: U.S. Department of Commerce, Statistics Canada

because the market is too small. So it's not surprising that imports are coming in.

It's generally true that, when a country's economy is growing, it imports more. And the Canadian economy is doing very well these days. As a result, a lot of these specialty chemicals are being brought in to meet increased demand of the industries that use them. So a significant part of the increase in imports reflects our economy.

What about the other sectors?
Inorganics are just about in balance, perhaps a little bit positive. The situation in inorganics trade really hasn't changed all that much over the years. Looking at petrochemicals, we see that, 1986 versus 1985, exports are down in dollar terms, but up in volume terms.

One major point, though. When you look at our total chemical exports in volume terms, they increased slightly more than 2% last year. So we believe that we have been able to maintain our international market share.

Is that trend carrying over to this year?
I'm not familiar with the statistics for 1987. What I do see, however, is that profitability, both on exports and domestic sales, is improving. You recall that 1982, 1983, and 1984 were disastrous years, even 1985. In 1986, profitability came back a little bit. But this year, with energy deregulation almost in place, with changes that our companies have made to improve productivity, and with firmer prices, chemical company profits are looking good.

Will those improved profits trigger a new round of direct investment in the Canadian chemical industry?
For some chemical sectors, such as specialties and inorganics, I think that what happens with the trade agreement and what they will have to do to adjust to it will be more important than current profit levels as far as investments are concerned. On the petrochemical side, I believe that the lack of new investment over the past few years was the result of poor international markets rather than profits.

What you're saying, then, is that overcapacity was the basic problem for Canadian petrochemicals?
Well, we certainly had to absorb a lot of overcapacity that started coming to a head around 1982. At that time, everybody was making assumptions about the direction of the market that didn't come to pass.

So I would expect that the capacity situation will dictate when new investments will be made. I think that we are getting closer to the point where somebody, somewhere in the world, will start thinking about petrochemical investment. And we believe that Canada is a good place to invest. Deregulation has helped. And Canada is one of the few countries in the world that is resource-rich and has a stable government.

Alberta Gas Ethylene is going ahead with its long-delayed, third ethylene plant. Is this a harbinger of things to come?
I can't comment on that plant specifically, but it is symptomatic that the people of Canada are not discouraged by the tough, recent past. They are indeed optimistic that we can be full-fledged participants in the future growth of the international chemical industry.

Do you see any Japanese investment in the Canadian chemical industry?
Not yet, but with other Japanese companies investing in downstream industries in Canada, we think that it will only be a matter of time. We think that Japanese chemical companies will follow these downstream companies into Canada, with the idea of supplying these companies in Canada just as they do in Japan. It's also possible that Japanese chemical firms might invest in Canada to export back to their home base, just as they have been doing in other parts of the world.

True, Japanese chemical companies have invested heavily in other parts of the world. Why not Canada by now? You should ask them. But seriously, when the major chemical investments were being made in Canada in the late 1970s and the early 1980s, FIRA was still a major concern to many foreign investors. I imagine that this may have weighed heavily on the minds of the Japanese.

In addition, the very fact that these Japanese chemical companies were investing heavily in these other areas that they considered beneficial to them may have precluded additional investments in Canada. Putting all of these things together, it was just a question of the circumstances at the time. This could change in time, though. □